

## **REMARKS**

### **Status**

This Amendment is responsive to the Final Office Action dated February 21, 2007, in which Claims 1-11 were rejected. Claims 1 and 8 are presented in an amended form. Accordingly, Claims 1-11 are pending in the application, and are presented for reconsideration and allowance.

### **Claim Rejection - 35 USC 102**

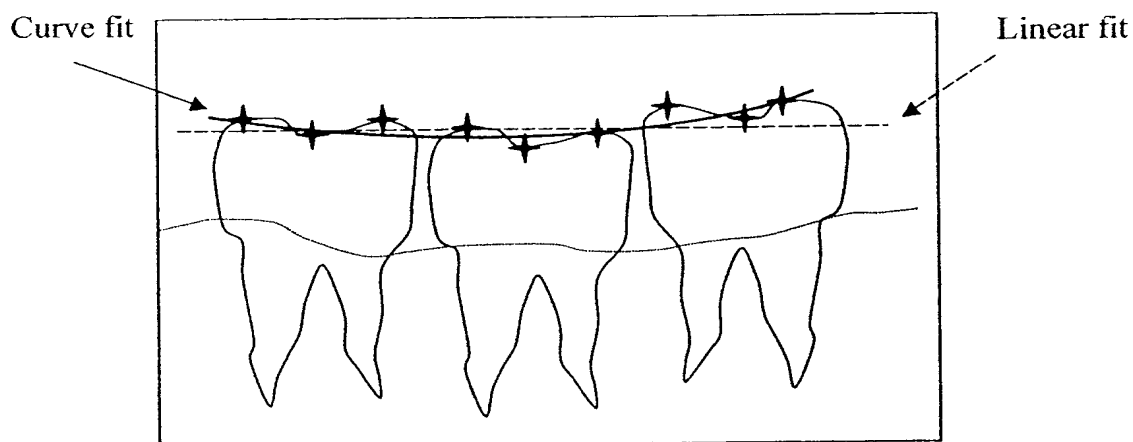
Claims 1-8 and 10 stand rejected under 35 USC 102 as being anticipated by US Patent No. 6,512,994 (Sachdeva). This rejection is respectfully traversed.

As the Examiner pointed out in the Final Rejection, the scaling adjustment taught by Sachdeva "... is based on an assumption that the video data 10 will have a *linear* error term in each of the x, y and z axis..." (referencing col. 4, lines 57-59 of Sachdeva, emphasis added). Accordingly, "... a *single scaling factor* is determined and used to scale each of the teeth as well as the other aspects of the orthodontic structure of the patient." (col. 4, lines 59-61, emphasis added). However, a linear term (as well as a single scaling factor) in each of the x, y and z axes is not sufficient for purposes of the present invention, that is, not sufficient to carry out the claimed method as amended in response to the earlier Office Action mailed September 26, 2006.

As described on page 8, lines 26-28, and page 9, lines 10-12, of the present specification, the key vertices 52, or the center of mass points 60, are indicated or computed for each tooth and a curve 54, or curve 62, is fitted through the vertices or points. These curves indicate the shape and mis-alignment that must be adjusted for. Accordingly, the adjustment of the 3-dimensional model to correct for shape and mis-alignment is then performed in step (e) of Claim 1. The important thing to note is that, as would be understood by one of ordinary skill in these arts, these curves are second order, nonlinear fittings, and therefore the claimed adjustments require a nonlinear term in at least one of the x, y and z axes.

The necessity for a nonlinear adjustment can be seen in the following representation of FIG. 4 of the patent application, showing a fitted curve (“curve fit”) equivalent to curve 54 through the points and additionally showing a linear fitting (“linear fit”) through the same points.

Fitting a curve results in less error vs. using a simple line



As can be seen from FIG. 4 of the application, the curve 54 is fitted so as to be a best fit to the vertices 52. As one of ordinary skill in this art would understand, curve 54 is a nonlinear fitting based upon a nonlinear term. In contrast, the straight line shown in the drawing above is based on a linear term in each of the x, y and z axes – as Sachdeva would teach. As can be seen from the above drawing, using a nonlinear fitting produces less error than using a linear fitting.

In summary, and as shown for example in FIGS. 4 and 7 of the patent application, the respective curves 54 and 62 are fitted through the corresponding points to describe the shape and mis-alignment of the teeth adjacent to the prosthesis. These curves are necessarily nonlinear. Indeed, these points cannot be fitted accurately enough with a linear error term. The accurate fitting is required to assure a proper bite between the upper and lower arch, which is what the applicants are describing in their present application (see, e.g., page 3, lines 12-20). (It should also be noted that the adjustments described in relation to FIGS. 9, 11 and 12 also effectuate a nonlinear fitting.)

As mentioned in the response to the earlier Office Action mailed September 26, 2006, the term dental arch is used differently in Sachdeva than in the present application. In Sachdeva, the dental arch appears to be the upper and lower horseshoe-shaped, substantially horizontal orthodontic structure seen, e.g., in FIGS. 1D and 1E of the reference. In the present application, the dental arch refers to “noticeable arch(ing) in the vertical direction as can be seen in particular relative to a gum line 34” (see page 7, lines 12-13), wherein the aforementioned vertical alignment pertains to “the relative vertical position of a patient’s teeth as compared to the adjacent teeth” (see page 4, line 7). Furthermore, in Sachdeva the simple scaling procedure does not effect any adjustment of the teeth individually as to adjacent teeth, but only as part of an adjustment to the whole orthodontic entity. In order to adjust the shape and mis-alignment of a single tooth (or a group of teeth) that is a candidate for a prosthesis, there is a need for tooth-to-tooth points for a longitudinal examination of the mouth, that is, for a

nonlinear fitting to the shape and mis-alignment. As can be seen in Figures 1, 3, 4, 6, 7, 9, 11 and 12, the vertical and horizontal mis-alignment of at least three teeth in the 3-dimensional model is determined relative to the digital image obtained from the radiograph – where, e.g., the middle tooth (or teeth) is the candidate for the prosthesis (e.g., a crown or a bridge), as especially shown in FIGS. 11 and 12. As would be understood by one of ordinary skill, this feature is embodied in a nonlinear adjustment.

It is axiomatic that for prior art to anticipate under §102 it has to meet every element of the claimed invention. *Hybritech Inc. v. Monoclonal Antibodies, Inc.* 231USPQ 81, 90 (Fed. Cir. 1986). Anticipation under 35 U.S.C. Section 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention. *Rockwell International Corp. v. United States* 47USPQ2d 1027, 1031 (Fed. Cir. 1998). The foregoing remarks indicate that Sachdeva cannot anticipate the claims inasmuch as the nonlinear fitting exemplified by paragraphs (d) and (e) of Claim 1 is not disclosed by Sachdeva. However, to further clarify this distinction, Applicants are proposing to amend Claim 1 to include the term “nonlinear” in paragraph (e) in relation to the shape and misalignment, and to refer to the adjustment as “providing precisely fitted curvature data of the teeth as part of a dental arch” (which is supported, e.g., by page 3, lines 12-20 of the specification).

Recognizing that this response is after a Final Rejection, Applicants believe that any amendments to the claims in this response, which will place the case in condition for allowance, do not raise any issue of new matter and do not present new issues requiring further consideration or search. Since these amendments are now being offered after consideration of the Examiner’s response to Applicant’s prior arguments, and in order to facilitate further understanding of the necessity for a nonlinear adjustment, this should now constitute a sufficient showing of good and sufficient reasons as to why the amendments are now necessary and were not earlier presented. Thus, these amendments are believed to comply with the requirements in 37 CFR 1.116 for the entry of an amendment after a final rejection, thereby placing the

case in condition for allowance or, at the minimum, in better form for consideration on appeal.

With regard to the dependent claims 4, 6 and 8, there appears to be nothing in Sachdeva that discloses identifying key vertices, centers of mass, or outlines of the teeth in the radiograph and fitting a curve through the vertices or centers of mass, or matching the outlines. The passages cited by the Examiner offer no suggestion for fitting a curve across vertices or centers of mass, or matching outlines, particularly in three or more teeth.

### **Claim Rejection - 35 USC 103**

Claims 9 and 11 stand rejected under 35 USC 103 as being unpatentable over US Patent No. 6,512,994 (Sachdeva) in view of US Patent No. 4,648,640 (Rubbert et al.). This rejection is respectfully traversed.

Dependent claims 9 and 11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sachdeva in view of Rubbert et al. (US patent No. 6,648,640). Since claims 9 and 11 depend from claim 2 and amended claim 1, which is believed to be allowable for reasons as expressed above, dependent claims 9 and 11 should likewise be allowable in view of their dependency.

### **Amended Claim 8**

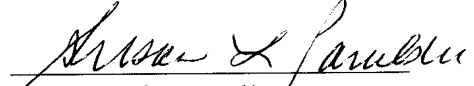
The amendment to Claim 8 is intended to correct an incorrect reference to a paragraph in the parent Claim 1. No new matter is added by this amendment, and this amendment is not made to overcome any substantive rejection.

### **Summary**

Should the Examiner consider that additional amendments are necessary to place the application in condition for allowance, the favor is requested of a telephone call to the undersigned counsel for the purpose of discussing such amendments.

For the reasons set forth above, it is believed that the application is in condition for allowance. Accordingly, reconsideration and favorable action are respectfully solicited.

Respectfully submitted,

  
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